

**OPERATION AND MAINTENANCE PLAN
WAUKEGAN HARBOR SITE
WAUKEGAN, ILLINOIS**

US EPA RECORDS CENTER REGION 5



399211

TABLES OF CONTENTS

	<u>PAGE</u>
LIST OF TABLES	i
LIST OF FIGURES	ii
LIST OF APPENDICES	iii
1.0 INTRODUCTION	1
2.0 MAINTENANCE IN FINAL COVER AND INSPECTION	3
2.1 Inspection Schedule	3
3.0 GROUND WATER MONITORING	5
3.1 Monitoring Well Maintenance	9
4.0 GROUND WATER EXTRACTION, TREATMENT AND DISCHARGE	10
5.0 REPORTING	14
TABLES	
FIGURES	
APPENDIX A	
APPENDIX B	

LIST OF TABLES

i

TABLE
NUMBER

TITLE

1

Containment Cell Cover Compositions

LIST OF FIGURES

FIGURES
NUMBERDRAWING
NUMBERTITLE

1

86-059-E76

Site Plan

LIST OF APPENDICES

APPENDIX A

Record Keeping Requirements

APPENDIX BLong-Term Water Treatment Facility
Sampling Frequency

**OPERATION AND MAINTENANCE PLAN
WAUKEGAN HARBOR SITE
WAUKEGAN, ILLINOIS**

1.0 INTRODUCTION

This document constitutes the Operation and Maintenance (O&M) Plan for Waukegan Harbor Site (Site).

When the remedial activities at the Site are complete, three separate soil-bentonite wall-enclosed containment cells with covers, ground water extraction wells, ground water piezometers, ground water monitoring wells, and a water treatment facility will be operated and maintained. The three containment cells are shown on Figure 1 and are designated as the Slip No. 3 Containment Cell, West Containment Cell, and East Containment Cell. The containment cells will encompass areas of 1.5 acres, 3.4 acres, and 5.5 acres, respectively, and will be covered with a combination of bituminous concrete and vegetative covers. Table 1 summarizes the composition of each cell cover. Ground water extraction wells in each containment cell will provide an inward hydraulic gradient by maintaining the water level within the cell at a lower hydraulic level than the natural ground water level outside the cell. Piezometers within each cell will be paired with a ground water monitoring well outside the cell. The monitoring well piezometer pairs will be used to monitor the hydraulic gradient across each

containment cell boundary. The ground water monitoring wells will also be used for obtaining samples of the ground water immediately outside of each containment cell soil-bentonite wall. The ground water treatment facility will treat the ground water extracted from each containment cell prior to discharge to the North Shore Sanitary District or to an on-site location approved by U.S. EPA. Within 30 days of the completion for the final cap of each containment cell, the operation and maintenance requirement of this Plan shall commence with respect to that cell.

The operation and maintenance of the water extraction and treatment system, containment cell caps, and ground water monitoring system will continue for the period provided by Section V.D.9 of the Consent Decree. The program will include a regular inspection and monitoring schedule as described in the following section. An indication of PCBs in the monitoring well system will be assessed under the compliance procedures in Section 4.0, and if the results indicate the soil-bentonite wall is failing to operate as designed, the wall will be repaired subject to approval of the United States Environmental Protection Agency (U.S. EPA). The operation and maintenance program is subject to modification pursuant to Section V.D.9 of the Consent Decree.

2.0 MAINTENANCE OF FINAL COVER AND INSPECTION

The top surface of the final cap will consist of either bituminous concrete or top soil overlying a drainage layer and an HDPE synthetic liner. The top surface of the cap will be inspected in accordance with the following schedules, and repairs will be completed as soon as practical, weather conditions permitting, after discovery of need for repair. Inspections will provide a regular documented method of insuring the integrity of the protective cover.

2.1 Inspection Schedule

If a bituminous concrete cover is installed, it will be inspected each spring during the post-closure care period. Cracks will be sealed with asphalt sealer. Potholes or other deterioration of the asphalt surface will be repaired using procedures recommended by the Asphalt Institute in MS-16 (Asphalt Pavement Maintenance, 1967).

If a vegetation and topsoil cover is installed, it will be mowed twice per growing season and fertilized annually in the spring of each year during the post-closure care period. In addition, the vegetative cover will be inspected, every three months during the first two years after completion of closure, semi-annually for the next two years and each spring during the remainder of the post-closure care period.

Any gullies or washes in the top soil cover will be backfilled, compacted, reseeded, and mulched with straw. Any areas of dead vegetation will be similarly treated. Lined or riprapped drains will be installed if persistent erosion recurs in the same location.

If it is necessary to excavate into the containment cells or if damage otherwise occurs to the drainage layer or synthetic liner, the following repair procedures will be followed.

1. The synthetic surface will be exposed and inspected for signs of physical damage (punctures, slits or tears). This may require cutting and removing or rolling back the synthetic drainage materials.
2. The liner will be exposed at least 12 inches in all directions from the damaged area.
3. In the case of a puncture, the damaged area will be repaired by the application of extruded material or a glued patch.
4. For a tear, slit or large puncture, the flaw will be overlain by a panel of the same material which will be bonded to the existing liner by an extrudate weld or by glueing.
5. The extrudate weld or glued seam will be checked using a vacuum box.
6. The synthetic filter or drainage layer will be replaced and fastened in place to the existing drainage layer.

3.0 GROUND WATER MONITORING

Twelve ground water monitoring wells or such greater number as determined to be necessary in the approved Design Report, will be sampled and analyzed for PCBs on a quarterly basis for the first two years and semi-annually for the remainder of the post-closure period. Analyses for PCBs will be by gas chromatograph U.S. EPA Method 608.

The ground water monitoring wells will be installed after completion of the soil-bentonite slurry wall at each containment. The wells will be labeled with permanent weatherproof designations. Background analysis will be established by the first four quarterly seasonal sampling occurring after well installation.

Ground water sampling will be completed in accordance with the Remedial Action Quality Assurance Project Plan as follows:

1. The water level in the well will be measured and recorded using an electric tape.
2. The electric tape will be rinsed with deionized water between wells.
3. A sampling pump will be used to evacuate at least three well volumes of water. The purge water will be discharged on the ground surface unless previous sampling indicated PCB levels of more than 0.010 ppm. Water which cannot be discharged on the ground will be recharged into the containment extraction wells.
4. A pre-cleaned one liter glass bottle will be filled with water, sealed, and transported to a laboratory

which meets the quality assurance standards for U.S. EPA Method 608.

5. The recharge rate of the well will be recorded for up to one hour.

The record keeping and chain-of-custody requirements for the sampling program are in Appendix A.

The ground water elevations in each of the piezometer/ground water monitoring well pairs will be measured quarterly and recorded on the ground water elevation monitoring log, Table A-3. The measurements will be used to control the extraction well pumps so that a hydraulic gradient differential is maintained across the containment cell soil-bentonite wall. The frequency of measuring and recording maybe reduced, as approved by U.S. EPA, if the rate of change in water elevations is less than an average of six inches per month. Conversely, the frequency may be increased to account for changes that may result from changes in Lake level.

The ground water monitoring wells will be sounded annually to determine if the well is open. Sounding will be completed with a string and steel weight. The weight will be washed with distilled water between wells and the string will be discarded. Ground water detection monitoring, compliance monitoring, and corrective action programs will be completed as follows:

1. Hazardous Constituents - Ground water monitoring will be for PCBs and chlorinated organics per 40 CFR 761.75. The only other ground water monitoring will be monitoring for pH, conductivity, and temperature completed during the purging of the monitoring wells.

If the B.E.S.T. solvent extraction process is used for treating soils, the monitoring for the West Containment monitoring wells shall include triethylamine.

2. Well Locations - The well locations will be on a boundary which will be a vertical plane located approximately 20 feet from the soil-bentonite walls enclosing each in-place containment. The boundary may be closer or farther from the wall in certain locations to account for proximity to structures or other obstructions. Each monitoring well located on the boundary will be paired with a piezometer installed approximately 5 feet inside the soil-bentonite wall so that the differential water level across the soil-bentonite wall may be determined.
3. Compliance Period - The operation and maintenance program will continue for the period in Section V.D.9 in the Consent Decree.
4. Detection Monitoring - Water samples will be analyzed for PCBs by U.S. EPA Method 608 during detection monitoring. The detection limit will be 1 ppb. Reported values for PCB sampling of 1 ppb to 5 ppb above background will be noted for reassessment at the next monitoring event. PCB sampling results of more than 5 ppb above background will be verified by resampling and analysis within two weeks of receiving the laboratory results. A second result greater than 5 ppb above background will shift the ground water monitoring program into compliance monitoring, as provided in paragraph 5.

If the detection monitoring results indicate that the PCB level is consistently above the background level by less than 5 ppb and shows a continued increase at a rate of 1 ppb/quarter or more for three consecutive quarters, then the ground water monitoring program will move into compliance monitoring, as provided in paragraph 5.

The U.S. EPA will be provided written notification of a shift to compliance monitoring and a plan for the compliance monitoring within four weeks of confirmation that compliance monitoring is required. If the detection monitoring change in PCB level is greater than 10 ppb, then the U.S. EPA shall be notified by phone within 24 hour of confirmation of the detection monitoring results.

5. Compliance Monitoring - Compliance monitoring will be completed through the installation of additional monitoring well points along the boundary. The locations and construction details for the additional ground water monitoring points will be submitted to the U.S. EPA for approval prior to implementation of monitoring in the form of a Compliance Monitoring Plan within 30 days of the notification described in paragraph 4. The results of the compliance monitoring program will be used to determine if PCBs are migrating from the in-place containment area and will be used to assess the location from which the PCBs are emanating.

An Assessment Report will be prepared assessing whether PCBs are migrating from the IPC cells and describing what, if any, corrective action measures are necessary. The Assessment Report shall be prepared in accordance with a schedule contained in the approved Compliance Monitoring Plan and shall be submitted to U.S. EPA for approval.

6. Corrective Action Program - If the Assessment Report indicates that corrective action is required, such corrective action will be carried out in accordance with this paragraph. The corrective action program may include repair of the soil-bentonite wall by re-excavation and reinstallation, drilling and grouting, vibratory beam grouting, or other repair methods. The details of the proposed corrective action including the quality control and assurance procedures and the monitoring procedures required to verify the corrective action (the "Corrective Action Plan"), will be submitted to the U.S. EPA for approval within 60 days of approval of the Assessment Report.

Corrective action will begin within 60 days of receiving U.S. EPA approval for corrective action, in accordance with the schedule and approved Corrective Action Plan.

The U.S. EPA will have access to observe the regular sampling and to obtain split samples during regular well sampling. The U.S. EPA will have access at other times if first pre-arranged with owner by written request, and if owner is allowed to

observe and enforce compliance with proper sampling and to obtain split samples.

3.1 Monitoring Well Maintenance

The elevation of the reference point on each monitoring well will be resurveyed at least once every five years. The top elevation will also be resurveyed if modifications are made to the well or if the well is inadvertently damaged.

A well which becomes filled with sediment as measured by soundings or has poor hydraulic performance will be cleaned by flushing with potable water. Sampling will not occur for at least one month after flushing of the well. If the well continues to perform poorly, the well will be replaced by installing a new well within 25 feet of the existing well and by decommissioning the former well in accordance with Illinois Administrative Code, Chapter I, Part 920.120, "Abandoned Wells".

4.0 GROUND WATER EXTRACTION, TREATMENT AND DISCHARGE

Ground water will be extracted from each containment cell at a rate which maintains an inward hydraulic gradient across the soil-bentonite wall. Average daily flow will be approximately 500 gallons per day and will likely be pumped and processed by intermittent pumping from the extraction wells.

The pumps will be inspected annually to insure that all high and low set points are operable and that the pump is in running condition. If pumping the well does not reduce the water level in the containment cell, the pump will be removed and the well screen cleaned with hydrogen peroxide or another oxidizer.

Extracted ground water will be processed through the long-term water treatment facility. The long-term water treatment facility will be a cartridge filter and two carbon adsorption units connected in series.

For the first completed containment cell, when the system is running continuously, a sample will be taken weekly for the first six months, then monthly for the next six months (if approved by the U.S. EPA), then quarterly thereafter as approved by U.S. EPA (Appendix B), at a sample point at the influent to the treatment system and also between the two carbon units. If the long-term water treatment system is operated on an intermittent basis, at least one water sample

will be collected between the two carbon units at both the start and the end of the operation. Samples shall be analyzed for PCBs.

If it is established through this monitoring program that the treatment system for the first containment cell is operating efficiently to meet said discharge limit, then a request may be made to reduce the sample frequency and number of samples for the first, second and third containment cells. The frequency sampling scheduled may also be modified, following approval by U.S. EPA in the event the discharge occurs to the North Shore Sanitary District.

If any sample equals, or exceeds 1 ppb, two additional samples will be collected within two weeks thereafter. If all these samples exceed 1 ppb, the following will be done promptly:

1. The lead carbon unit will be removed;
2. The second carbon unit will be switched to the lead position;
3. A new carbon unit will be installed as the second carbon unit; and
4. The cartridge filter element will be replaced.

The average concentration in the final effluent discharged shall not exceed a 1 ppb 30-day running average when water is generated. The final effluent shall be sampled monthly. The effluent may be discharged to the North Shore Sanitary District if the District, U.S. EPA and IEPA approve such discharge.

Such approval shall not be unreasonably withheld. In the event the effluent is not discharged to the District, said water may be discharged on-site at a location approved by U.S. EPA.

The exhausted carbon will be containerized, manifested, and transported for appropriate disposal, in accordance with federal, state, and local regulations.

If the pump and treatment system is shut-down for more than thirty (30) days, the treatment system will be hydraulically tested before start-up with either lake or potable water. The test will consist of pumping water through the treatment system at the same pumping rate as occurs during dewatering. The pressure drops through the system will be assessed to determine if the treatment equipment is ready for water treatment.

The treatment system will be located within a secondary containment area with a detection sump. If water spills from the carbon canisters or the connecting piping, a high level alarm in the detection sump will cut off electrical power to all extraction well pumps and will provide an alarm sign to a designated operator or guard.

After five years from the date of the Certificate of Completion of the Work, pursuant to Section XXIV of the Consent Decree, U.S. EPA may establish different effluent limitations for this discharge water if it determines that such limitations may be

Section: 4.0
Revision No.:
Date: August 22, 1988
Page: 13

achieved by the use of the best available technology. Any such determination by U.S. EPA shall be subject to dispute resolution procedures in Section XII of the Consent Decree.

Any of the above requirements may be modified pursuant to the V.D.9 of the Consent Decree.

5.0 REPORTING

Monitoring results from the ground water monitoring wells and the extraction well treatment system will be submitted to the U.S. EPA on a quarterly basis for the first two years and a semi-annual basis thereafter. The results of cover inspections, extraction well maintenance, and treatment system maintenance will be included with the reports on a yearly basis.

Reports will be issued within 45 days of receipt of each ground water monitoring test result. Reports on the operation of the water treatment system will be issued on a semi-annual basis. The discharge limits in the water treatment reports will be certified by a corporate officer or his approved designee.

APPENDIX A

RECORD KEEPING REQUIREMENTS

1.0 GROUND WATER MONITORING

The ground water monitoring record keeping forms are found in Tables A-1 through A-3. Table A-1, Field Sample Data, and Table A-2, Well Development Log, are used concurrently for recording pertinent information during the purging and sampling of a monitoring well. Table A-3, Ground Water Elevation Monitoring Log, is used for recording ground water level information of the monitoring well/piezometer pairs.

1.1 Well Purging and Sampling

Immediately prior to purging each well, the depth from top of well casing to top of water surface and to bottom of well will be determined to the nearest 0.05 foot and recorded as a portion of the well sample data (see Tables A-1 and A-2). Jetting methods will not be used for purging the monitor wells. The method for purging and sampling of the monitoring wells is with dedicated submersible bladder-type pumps providing a uniform rate of discharge. Teflon tubing will be used for intake/discharge lines as required for sample pump operation. All monitoring wells will be capped and locked to prevent unauthorized access to the well and the possible contamination of the well between sampling episodes.

Monitoring wells will be purged by removing at least three well volumes determined as the total depth of the well minus the depth to the water surface times the area of the well.

At each well to be sampled, purged waters will be monitored during purge for temperature, pH, and conductivity as a function of time (see Table A-2). This data will be accurately recorded such that the variation of parameters may be related to elapsed purging time. These relationships along with sample data from selected purge evaluation wells will be used to establish specific purging volumes for each well. Purging methods,

volumes, times, and any other pertinent information will be recorded and reported by the sampling team (see Tables A-1 and A-2).

The ground water samples will be placed in glass bottles fitted with caps having Teflon-faced silicon seals. The sample bottles will be one liter in size. Each sample bottle will be labeled with the following:

1. Name of sampling team;
2. Site name;
3. Location identification;
4. Sampling date.

The water sample, when collected, will totally fill the sample bottle. Samples will be placed in an ice chest or similar container capable of maintaining an even temperature while the samples are transported to the laboratory. The packaging and shipping procedures will be in accordance with the accepted standards for the type of analysis requested. Two separate sample bottles of ground water will be collected at each monitoring well as the sample set, so that duplicate samples are available for QA analysis, if required.

1.2 Quality Assurance

An established program of sample chain-of-custody procedures, that is followed during sample collection and handling activities in both the field and laboratory operations, is required to assure that sample integrity is maintained and data generated through the analysis of the samples is applicable to evaluation of the site. The sample custody program as well as the quality assurance procedures regarding the construction water treatment facility water samples will be utilized for the ground water monitoring samples. These procedures will be in the Quality Assurance Project Plan

(QAPP) for the Waukegan Harbor Site. The QAPP will be prepared during the design phase.

Laboratory QA data and other supporting data will be maintained in accordance with the Consent Decree.

PROJECT No. _____

FIELD
ENGINEER _____

PAGE _____ OF _____

PROJECT NAME _____ DATE _____

FIELD DATA:

WELL SAMPLED

☐

TOP OF CASING ELEVATION _____

DEPTH TO GROUND WATER FROM T.O.C., FT. _____

GROUND WATER ELEVATION _____

PURGE DATE _____

PURGE METHOD _____

START PURGE _____ ELAPSED TIME _____ HRS. VOLUME PURGED _____
(SEE WELL DEVELOPMENT LOG FOR PURGING DETAILS)

SAMPLER TYPE _____ : 1. SUBMERSIBLE PUMP 2. BLADDER PUMP 3. BAILER
4. OTHER(SPECIFY) _____

SAMPLER MATERIAL _____ : 1. STAINLESS STEEL 2. TEFLON 3. PVC
4. OTHER(SPECIFY) _____

TUBING MATERIAL _____ : 1. TEFLON 2. POLYETHYLENE 3. TYGON 4. SILICON
5. OTHER(SPECIFY) _____

SAMPLE APPEARANCE _____

SAMPLE pH _____ TEMPERATURE _____ SPECIFIC CONDUCTANCE _____

COMMENTS:

WEATHER: _____

OTHER: _____

